

Claims

What is claimed is:

1. A flexible pipe comprising at least one layer, and an insert disposed in the layer, the cross-sectional area of the diameter of the insert varying around the circumference of the insert.
2. The pipe of claim 1 wherein the external surface of the arcuate portion of the insert conforms to the corresponding inner surface of the layer in an abutting relationship for the entire length of the pipe.
3. The pipe of claim 1 wherein the inner diameter of the insert varies from a minimum to a maximum around the inner circumference of the insert, with the minimum diameter being diametrically opposed to the maximum diameter.
4. The pipe of claim 3 wherein the inner diameter of the insert varies from two minimum diameters to two maximum diameters around the inner circumference of the insert.
5. The pipe of claim 4 wherein one of the minimum diameters is diametrically opposed to one of the maximum diameters, and wherein the other minimum diameter is diametrically opposed to the other maximum diameter.
6. The pipe of claim 4 wherein one half of the insert nests in the other half when the pipe collapses.
7. The pipe of claim 6 wherein the nested inserts attain a substantially flat configuration.

8. The pipe of claim 4 wherein the medium thickness of the insert is substantially equal to the thickness of the at least one layer.
9. The pipe of claim 1 wherein the insert limits the strain on the at least one layer when the pipe collapses.
10. The pipe of claim 1 wherein there is at least one reinforcing layer extending around the insert and one outer tubular layer extending around the outermost reinforcing layer.
11. A flexible pipe comprising at least one layer, and an insert disposed in the layer and comprising two arcuate sections, the corresponding ends of which engage each other in a manner to form articulations to permit pivotal movement between the engaging ends.
12. The pipe of claim 11 wherein the external surfaces of the arcuate sections conform to the corresponding inner surface of the layer in an abutting relationship for the entire length of the pipe.
13. The pipe of claim 11 wherein each of the insert sections extends for approximately 180 degrees.
14. The pipe of claim 11 wherein the engagement of two of the corresponding ends is diametrically opposed to the engagement of the other two corresponding ends.

15. The pipe of claim 11 wherein the corresponding inner surfaces of the sections engage when the pipe collapses so that the insert and the pipe attain a substantially flat configuration.
16. The pipe of claim 11 wherein the insert limits the strain on the at least one layer when the pipe collapses.
17. The pipe of claim 11 wherein there is at least one reinforcing layer extending around the insert and one outer tubular layer extending around the outermost reinforcing layer.
18. A flexible pipe comprising at least one layer, and an insert disposed in the layer, and formed by a flexible metallic ply having a circular cross section, approximately one half of the circular cross section of the ply being folded over its other half portion to form a substantially arcuate configuration having enlarged side portions.
19. The pipe of claim 18 wherein the external surface of the insert conforms to the corresponding inner surface of the layer in an abutting relationship for the entire length of the pipe.
20. The pipe of claim 18 wherein the enlarged side portions control the radius of the longitudinal fold in the wall of the pipe when the pipe collapses.
21. The pipe of claim 18 wherein the insert extends angularly for approximately one-half the internal diameter of the layer.
22. The pipe of claim 18 wherein the insert limits the strain on the at least one layer when the pipe collapses.

23. The pipe of claim 18 wherein there is at least one reinforcing layer extending around the insert and one outer tubular layer extending around the outermost reinforcing layer.

24. A pipe comprising at least one layer, and a tubular insert disposed in the layer, the circumference of the outer diameter of the insert being constant, and the circumference of the inner diameter of the insert being constant but for two diametrically opposed areas, each having a reduced cross-section.

25. The pipe of claim 24 wherein the external surface of the insert conforms to the corresponding inner surface of the layer in an abutting relationship for the entire length of the pipe.

26. The pipe of claim 24 wherein the reduced cross-sectional areas of the insert permit the insert to attain a substantially flat configuration when the pipe collapses.

27. The pipe of claim 25 wherein, in the collapsed condition of the pipe, the insert controls the radius of the longitudinal fold in the wall of the layer which limits the strain on the layer at the longitudinal fold.

28. The pipe of claim 24 wherein the reduced cross-sectional areas are diametrically opposed.

29. The pipe of claim 24 wherein the insert limits the strain on the at least one layer when the pipe collapses.

30. The pipe of claim 24 wherein there is at least one reinforcing layer extending around the insert and one outer tubular layer extending around the outermost reinforcing layer.

31. A pipe comprising at least one layer, an insert disposed in the layer, an arcuate insert disposed within the layer, and a plurality of articulated cylindrical members embedded in the insert.

32. The pipe of claim 31 wherein the cross-section of the insert extends for approximately one-half the internal diameter of the layer.

33. The pipe of claim 31 wherein the external surface of the insert conforms to the corresponding inner surface of the layer in an abutting relationship for the entire length of the pipe.

34. The pipe of claim 31 further comprising a link connecting adjacent cylindrical members.

35. The pipe of claim 31 wherein the cylindrical members are in the form of cables that transmit electrical power.

36. The pipe of claim 31, wherein the cylindrical members are in the form of tubular members that receive a fluid.

37. The pipe of claim 31 wherein, in the collapsed condition of the pipe, the pipe attains a substantially flat configuration.

38. The pipe of claim 37 wherein, in the collapsed condition of the pipe, the insert controls the radius of the longitudinal fold in the wall of the layer which limits the strain on the layer at the longitudinal fold.
39. The pipe of claim 31 wherein there is at least one reinforcing layer extending around the insert and one outer tubular layer extending around the outermost reinforcing layer.
40. A method of manufacturing a flexible pipe comprising disposing a flexible metallic ply having a circular cross section in an outer tubular layer, and folding over approximately one half of the circular cross section of the ply over its other half portion to form a substantially arcuate configuration having enlarged side portions.
41. The method of claim 40 further comprising conforming the external surface of the insert to the corresponding inner surface of the layer in an abutting relationship for the entire length of the pipe.
42. The method claim 40 further comprising controlling the radius of the longitudinal fold in the wall of the pipe with the enlarged side portions when the pipe collapses.
43. The method of claim 40 further comprising limiting the strain on the at least one layer when the pipe collapses.